# Aditya Saraf

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https://adityasaraf.github.io/


## RESEARCH INTERESTS

Economics and Computer Science, Behavioral Economics, Game Theory, Networks, Complexity Theory

## EDUCATION

**UNIVERSITY OF WASHINGTON,** Seattle, WA — June 2020
*Master of Science in Computer Science, GPA: 3.98*

**UNIVERSITY OF WASHINGTON,** Seattle, WA — June 2019
*Bachelor of Science in Computer Engineering, Magna cum laude, GPA: 3.86*

- Minor: Philosophy
- Phi Beta Kappa (ΦBK) member

## RESEARCH PROJECTS

**TIME-INCONSISTENCY IN COMPETITIVE PLANNING PROBLEMS** — December 2019–current
*With Anna Karlin and Jamie Morgenstern (UW)*

- Analyzed a model of present bias (i.e. procrastination) in graph-based planning problems introduced by Jon Kleinberg et al. Existing work shows that present bias can result in exponentially higher cost compared to optimal behavior
- Added competition between multiple biased agents to the model; showed that competition alleviates some of the harms of present bias, and can naturally guide agents towards optimal behavior
- Canonical applications include businesses competing to get to market first, incentivizing students to complete assignments, incentivizing customers to join and use gym facilities, etc.

**QUALITATIVE PROBABILITY FOR STATISTICAL PRINCIPLES** — January 2019–current
*With Conor Mayo-Wilson (UW)*

- Worked within a formal system of qualitative conditional probability to prove statistical principles
- Showed that Bayesian foundations (of algorithms, decision theory, etc.) apply even when agents might lack quantitative degrees of belief
- Presented our initial findings at FEW (Formal Epistemology Workshop) 2019

**RELAXING COMMON BELIEF FOR REVOLT GAMES** — October 2020–current
*With Grant Schoenebeck (UMich)*

- Explore a relaxation of common belief (which is itself a relaxation of common knowledge) that we apply to analyze strategic coordination on social networks.
- Focus on *revolt games*, a diverse model which can capture social unrest as well as shifting social norms

**BAYESIAN DIFFERENTIAL PRIVACY FOR CORRELATED DATA** — October 2019–June 2020
*With Grant Schoenebeck (UMich), Fang-Yi Yu (UMich), and Jie Gao (Rutgers)*

- Worked with a recent generalization of differential privacy called Bayesian differential privacy, which protects against a wider class of adversaries than standard differential privacy
- Analyzed highly correlated data sets, where traditional differential privacy falls short
- Created sanitized datasets for offline analysis, to enable "local" privacy that works even in distributed settings.
- Proved the near optimality of our mechanism.

**COMPLEXITY OF HIDDEN GRAPH PROPERTIES** — June 2018–September 2018
*With Aarthi Sundaram (UMD)*

- Worked in a unique property testing framework where an oracle *hides* access to the graph (edges cannot be directly queried)
- Analyzed the relative complexity of various classes of hidden graph properties and developed a transfer theorem from graph properties in the hidden setting to constraint satisfaction problems in the standard setting

**TECH POLICY LAB** — September 2016–June 2017
*With Emily McReynolds (UW)*

- Researched privacy and security concerns around upcoming technologies in the fields of autonomous vehicles, the Internet of Things, and cell-site simulators
- Co-authored "Toys that Listen: A Study of Parents, Children, and Internet-Connected Toys", published in CHI'17

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## FUNDED RESEARCH POSITIONS

**RESEARCH ASSISTANT**, University of Michigan — October 2020–present
Funded by Grant Schoenebeck to work on Relaxing Common Belief for Revolt Games (see above)

**RESEARCH SCIENTIST**, University of Washington — June 2020–September 2020
Funded by Anna Karlin to work on Time-Inconsistency In Competitive Planning Problems (see above)

## SIGNIFICANT PAPERS

1. Aditya Saraf**,** Anna Karlin, Jamie Morgenstern. *Competition Alleviates Present Bias in Task Completion.* WINE 2020 (forthcoming)
2. Darshan Chakrabarti, Jie Gao, Aditya Saraf, Grant Schoenebeck, Fang-Yi Yu. *Optimal Local Bayesian Differential Privacy over Markov Chains.* Presented at MD4SG'20. In submission at SIGMOD'20.
3. Conor Mayo-Wilson, Aditya Saraf. *Qualitative Robust Bayesianism and the Likelihood Principle*. Early draft presented at FEW 2019. In submission at *Statistical Science.*
4. Conor Mayo-Wilson, Aditya Saraf. *Collectivist Foundations for Bayesian Statistics*. In submission at *Philosophers' Imprint*
5. Emily McReynolds, Sarah Hubbard, Timothy Lau, Aditya Saraf, Maya Cakmak, and Franziska Roesner. 2017. *Toys that Listen: A Study of Parents, Children, and Internet-Connected Toys.* CHI '17

Drafts of these papers (and more) can be found on my website: https://adityasaraf.github.io/

## TEACHING EXPERIENCE

CSE 311**: FOUNDATIONS OF COMPUTING I,** UW, Instructors: Kevin Zatloukal, Emina Torlak — September–December 2018
*The first class in the major, teaching the basics of logic, discrete math, and formal languages.*

CSE 421: **INTRODUCTION TO ALGORITHMS,** UW, Instructors: Various — Spring '18, Winter '19, Spring '19
*An upper division algorithms class taught primarily to juniors/seniors.*

CSE 490C: **CRYPTOGRAPHY,** UW, Instructor: Huijia (Rachel) Lin — September 2019–December 2019
*An upper division class on formal cryptography.*

CSE 590/490Z: **INCENTIVES IN COMPUTER SCIENCE,** UW, Instructor: Anna Karlin — January 2020–June 2020
*A class for master's students and advanced undergraduates that surveys topics between economics and computation.*

## INDUSTRY EXPERIENCE

**AMAZON,** Seattle, WA — June 2017–September 2017
*Exports and Expansion Technology – Customer Experience*

***Software Development Engineer Intern***

- Created a full stack application with Spring MVC (Java), including a web-based frontend server and a RESTful backend service.
- Had end-to-end ownership – discovered (internal) customer requirements; planned and designed the application; developed, tested and deployed the application to production.
- Reduced deployment cycle from 2-4 weeks to instant changes to production.

**DONUTS INC.,** Seattle, WA — June 2020–current

***Software Engineer***

- Working on a registry system that handles over 200 Top Level Domains (TLDs)
- Built a TLD import service, which is the technology that allows Donuts to acquire and merge TLDs from competing registrars